Patent claims

1. An apparatus for ascertaining the local oxygen turnover and/or the oxygen consumption and/or the oxygen content and/or the total amount of blood and/or the O_2 transport capacity and/or the transported O_2 amount and/or the oxygen consumption rate and/or the oxygen turnover rate, ascertained from the primary signals of the local hemoglobin concentration and/or the local oxygen saturation and/or the arterial oxygen saturation and/or the blood flow rate and/or the transported amount of blood and/or the tissue temperature, and data derived therefrom with an optical sensor (S) for placing on the tissue, with one or more light sources (W, L) which send light through optical fibers to the sensor (S), one or more detectors (DD, DR) which receive light backscattered from the tissue through optical fibers, and an evaluation unit.

2. The apparatus as claimed in claim 1, characterized in that there is provision of, as light source, a white light source (W) and/or a laser source (L) and, in addition, a temperature probe (DT).

3. The apparatus as claimed in claim 1 or claim 2, characterized in that a spectrometer, a spectroscope, a laser Doppler spectroscope, a tissue spectrometer, a tissue spectroscope and/or a pulse oximeter and/or a temperature measurement (DT) are provided as evaluation unit.

4. The apparatus as claimed in any of the preceding claims, characterized in that the measured volume of the optical sensor can be determined at any site at any time through evaluation of the various wavelength ranges and of the detector-transmitter separations, and information can be obtained from different depths.

5. The apparatus as claimed in claim 1, characterized in that the fibers of the sensor (S) are arranged on a circular shape around a central fiber or a temperature probe (DT).

6. The apparatus as claimed in claim 5, characterized in that one fiber each for the white light source (W) and for the laser (L), and in each case at least two detection fibers (DR, DD) lie on an arc of a circle at defined distances from the illumination sources, each of which are fed to a separate evaluation.

7. The apparatus as claimed in claim 6, characterized in that the detection fibers (DR) are evaluated together.

8. The apparatus as claimed in claim 1, characterized in that the illuminated fibers for a white light source and/or a laser light source lie on an open or closed arc of a circle directly around the central fiber and are illuminated by one or more light sources, with detection of the backscattered and/or laser Doppler signals taking place through the central fiber.

9. The apparatus as claimed in claim 8, characterized in that the illuminated fibers (W) and/or (L) lie on a larger radius and/or on different radii of a circle which are illuminated synchronously and/or alternately.

10. An apparatus for ascertaining the content of tissue pigments such as cytochromes, myoglobin, melanin, bilirubin or other pigments present in the tissue, and data derived therefrom as shown in Table 3 with an optical sensor (S) for pressing on the tissue, with one or more light sources (W, L) which send light through optical fibers to the sensor (S), and one or more detectors (DD, DR) which receive light backscattered from the tissue through optical fibers, and an evaluation unit.

11. The apparatus as claimed in claim 10, characterized in that the white light source (W) and/or a laser source (L) are provided as light source.

12. The apparatus as claimed in claim 10 or claim 11, characterized in that a spectrometer, a spectroscope, a laser Doppler spectroscope, a tissue spectrometer, a tissue spectroscope and/or a pulse oximeter are provided as evaluation unit.

13. The apparatus as claimed in any of the preceding claims, characterized in that information from different depths is obtained by selection of the wavelength range and of the detector-transmitter separation.

14. The apparatus as claimed in any of the preceding claims, characterized by a bundle of optical fibers which extends from the sensor (S) to the detector or to a camera, such as a color CCD camera, so that a two-dimensional image of the evaluated signals as shown in Table 1 and/or of the pigment parameters as shown in Table 3 can be generated.

15. The apparatus as claimed in claim 14, characterized by an additionally depth-selective sensor (S) or a depth-selective evaluation so that a three-dimensional image of the recorded measurements can be generated.

16. An oxygen sensor as set forth in any of the preceding claims for measurements on the eardrum, in which the primary signals of the tissue spectrometer (SO_2, Hb_{amount}), of the pulsatile tissue spectrometer, of the pulse oximeter ($SO_{2\ art.}$) and/or of the laser Doppler (blood flow) are recorded in a reflection measurement and combined with one another in order to be able to determine the oxygen

parameters as shown in Table 1 and/or the pigment parameters as shown in Table 3 via the ear sensor.

17. A method for ascertaining the local oxygen turnover and/or the oxygen consumption and/or the oxygen content and/or the total amount of blood and/or the O_2 transport capacity and/or the transported O_2 amount and/or the oxygen consumption rate and/or the oxygen turnover rate, by ascertainment from the primary signals of the local hemoglobin concentration and/or the local oxygen saturation and/or the arterial oxygen saturation and/or the blood flow rate and/or the transported amount of blood and/or the tissue temperature, and data derived therefrom, characterized in that an optical sensor (S) is placed on the tissue, light from one or more light sources (W, L) is passed into the body, and the light backscattered by the tissue is received and evaluated.

18. The method as claimed in claim 17, characterized in that additionally the temperature of the tissue is measured and evaluated.

19. The apparatus as claimed in claim 1, characterized in that the fibers with a separation x_i are illuminated and/or evaluated together.

20. The apparatus as claimed in any of the preceding claims, characterized in that a pressure indicator signal is generated via opposing light guides and/or light exit and entry regions (as shown in Fig. 12) and indicates the deformation of the tissue and/or of a membrane because of application of the sensor.